

COT 6401 The Analysis of Algorithms

Programming Project

Due: December 6, 2001

n couples $\{(h_i, w_i)\}$, where h_i and w_i are husband and wife of couple i , go to a movie theater and are seated in one row. Each person, except two seated at the two ends, has two neighbors. It is required that *each neighbor of a person k either has the same gender as k or is the spouse of k* . A *reasonable pattern* is an assignment of n couples without indices that meet the above requirement. For example, when $n = 3$ all reasonable patterns are as follows:

wwwhhh, hhhwww, whhwhh, hwwhww, whhhww, hwwwhh, wwhhh, hhwww

An *indirect solution* enumerates all patterns and, then, eliminates all un-reasonable (not reasonable) patterns by printing out reasonable patterns only. A *direct solution* systematically generates all reasonable patterns directly. You are required to provide solutions to print out all reasonable patterns using both indirect and direct solutions.

Submit a **hardcopy** of your project including the following four **sections**:

1. (no more than 5 pages)

Explain each solution in **plain English** first and, then, **pseudo code**. Specifically, pseudo code includes the way to enumerate all patterns in the indirect solution and the way to enumerate all reasonable patterns in the direct solutions.

2. (no page limit)

Write a C, C++, or Java code that will print out the following items for a given n :

- (a) the number of patterns (in the indirect solution)
- (b) all reasonable patterns
- (c) the number of reasonable patterns

Attach a hard copy of your code.

3. (no more than 2 pages)

Print out items (a) to (b) in section 2 for $n = 6$.

4. (no more than 1 page)

Tabulate execution time of each solution for $n = 5, 6, 7, 8,$ and 9 using the given format below. Provide a critical comparison between the indirect solution and the direction solution. Summarize the project using one paragraph.

	5	6	7	8	9
pattern (indirect)					
pattern (direct)					

- Arrange your report in the order of sections 1, 3, 4, and, then, section 2.
- Late submission will be penalized.
- Page limit will be strictly enforced.
- Handwritten report is not acceptable.